A Survey Examining the Correlations Between Japanese Little League Baseball Coaches' Knowledge of and Compliance With Pitch Count Recommendations and Player Elbow Pain

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ABSTRACT

Background: With the incidence of Little League elbow increasing, pitch limit recommendations for preventing throwing injuries have been developed in both the US and Japan. However, levels of knowledge of and compliance with these recommendations among coaches of young baseball teams in Japan remain unknown. The relationship between these levels and elbow pain among players has not been adequately studied.

Hypothesis: Knowledge of and compliance with these recommendations is similar in the US and Japan. Greater knowledge and higher levels of compliance have a significant correlation with reduced elbow pain in Little League baseball players.

Study design: Cross-sectional study

Methods: Coaches of youth baseball teams in Kyoto, Japan completed a questionnaire assessing knowledge of and compliance with recommendations. We surveyed team variables and coach-related factors concerning elbow pain among young baseball players, and demographic data and elbow pain history in the previous 12 months were investigated by the questionnaire.

Results: In total, 123 baseball coaches and 654 baseball players aged 6–12 years participated in this study; data were analyzed for 113 coaches and 339 players. Among coaches, 39.8% had accurate knowledge of (similar to the US data) and 28.3% complied with the recommendations (lower than the US data). There was no correlation between elbow pain and

knowledge of and compliance with the recommendations, but coaches' opinions on the number of games was indicated as a significant risk factor for elbow pain; the more coaches considered the number of games played, the fewer the number of players who experienced elbow pain.

Conclusions: The level of knowledge of recommendations in Japan was similar to that in the US, but compliance levels were far lower. There was no correlation between elbow pain and knowledge and compliance.

Clinical Relevance: The Little League elbow problem should be addressed at the global and national levels.

Keywords: Little League, coaches, pitch count recommendation, elbow pain

INTRODUCTION

Many people enjoy playing baseball both professionally and recreationally. There are millions of school-aged Little League baseball players worldwide, and Japan is one of the countries where baseball is most popular. As many as 15,000 youth baseball teams in Japan train on a daily basis.[7] However, the incidence of Little League elbow, the most severe throwing injury among children, is increasing.[2] This injury can sometimes result in children no longer being able to play baseball; therefore, prevention is crucial for Little League baseball players.[4,5,9]

Recent studies on the risk factors for throwing injuries among young baseball players in the US and Japan have recommended that pitch counts should be limited to protect players from throwing injuries (Table 1).[3,10,11] In 2006, the USA Baseball Medical & Safety Advisory Committee Guidelines provided science-based limits to reduce the risk of injury among 11- and 12-year-old athletes; this limit was 75 pitches per game and 100 pitches per week.[9,12] In 1995, the Japanese Society of Clinical Sports Medicine announced limits of 50 pitches per day and 200 pitches per week to prevent throwing injuries in 12-year-old baseball players.[8] However, these limits are meaningless without strict compliance. In our experience, recommendations stipulating that coaches should limit a player's pitch count are impractical—players must commit to honing their skills and pitchers must perform the same motion over and over again, flawlessly, to win games.

In the US, the ratios of youth baseball coaches' knowledge of and strict compliance with pitch count recommendations were surveyed by an anonymous internet-based questionnaire in 2012. This study showed that 43% of coaches had sufficient knowledge of pitch count limits, and 73% of coaches reported that they followed the recommendations, although their knowledge of the recommendation was poor.[1] However, the authors of that study stated that their research was limited because it was difficult to generalize the results for coaches in other geographic zones. Therefore, it is meaningful to study knowledge of and compliance with the pitch count recommendations in Japan. Additionally, the relationship between these ratios and elbow pain has not been investigated in sufficient detail thus far.

The current study aimed to determine knowledge of and compliance with Japanese pitch count recommendations among coaches of youth baseball teams in Japan and to compare these with the previous study conducted in the US. In addition, we investigated the relationship between these ratios and elbow pain in youth baseball players. We hypothesized that these ratios in Japan would be similar to those reported in the US and that greater knowledge and compliance with the pitch count recommendations would have a significant correlation with elbow pain in Little League baseball players.

METHODS

This was a cross-sectional study of coaches and players of youth baseball teams in Japan.

We created 2 original questionnaires, one targeting coaches and the other targeting Little League baseball players; these questionnaires were distributed to teams that participated in the annual tournament in Kyoto City in August 2011. A total of 111 teams received the questionnaires. In order to increase response reliability, we instructed the players' parents to work together with the players to help them in filling out the player questionnaires. After the parents had verified the responses, the coaches and the players/parents mailed their completed questionnaires back to us. This study was approved by the Institutional Review Board of XXXX University (Approval number: XXXX). We explained the purpose and methods of this study to the coaches and players' parents in detail in a verbal statement and obtained written informed consent from the coaches and players' parents.

The experimental protocol was established by a group that comprised an orthopedist and physical therapists. The questionnaire for coaches contained items on coach-related factors and team variables. These included data on the coaches' age, number of years that they had coached baseball, and number of years that they had played baseball. Also included in the questionnaire for coaches were items addressing the number of games per year played by the team they coached, their opinion on whether the number of games was few, a moderate amount, or many, total training days per week, presence or absence of an off-season, and if they had correct knowledge of and complied with the pitch count recommendations. The number of games per year was recorded as ≤50 or >50. Off-season was defined as the period

of time or season during which the players did not throw any pitches at all. Knowledge of the recommendation was ascertained with a question asking the coaches if they knew about the Japanese pitch count limit that prohibits 12-year-old players from throwing more than 50 pitches per day. For ascertaining the compliance, they were asked if they routinely complied with the limit.

The players were questioned about their age, height, weight, number of years spent playing baseball, and incidence of elbow pain within the last 12 months. Only episodes of pain in the elbow joint during actual throwing were considered for our analysis.

We calculated the ratio of coaches who had correct knowledge of the pitch count recommendations and who complied with these recommendations. Subsequently, we statistically analyzed the relationship between these ratios and coach age and years spent coaching baseball using the unpaired *t*-test. Following this, we demonstrated the interrelatedness of these factors using multivariate logistic regression models. We assigned episodes of elbow pain in the last 12 months as the dependent variable. The independent variables comprised: (1) the coach-related factors for the 58 head coaches of the 58 teams in this study (these 58 coaches were taken to represent the total of 123 coaches who participated in the study); and (2) the team variables for the teams that these 58 coaches were responsible for. We excluded players who had experienced elbow pain before August 2010. The results for the *t*-test and the multivariate logistic regression models were considered significant if the

P value was less than 0.05.

RESULTS

A total of 111 teams received the questionnaire, and 58 teams (123 baseball coaches aged 32–77 years, 48.0 ± 10.5 years and 654 players aged 6–12 years, all male, 11.3 ± 0.8 years) returned the questionnaire (collection rate, 52.3%). Data were statistically analyzed for those coaches and players who had filled out the questionnaire completely, without any omissions. Thus, we analyzed the data of 113 coaches (47.7 ± 10.4 years) and 339 players (11.4 ± 0.8 years).

In total, 45 of 113 coaches had correct knowledge of the pitch count recommendations (39.8%). Older coaches tended to have better knowledge of the limit but this difference was not significant (P = 0.07; Table 2). Among the 113 coaches, only 32 coaches reported that they routinely complied with the limit (28.3%). The unpaired *t*-test result showed that older coaches were significantly more likely to comply (P = 0.04; Table 3). We found no significant relationship between years spent coaching baseball and knowing about or compliance with the recommendations; but, we confirmed that those coaches who had been coaching longer tended to have higher rates of correct knowledge and compliance with the limit.

Among 339 players, 54 had experienced episodes of elbow pain in the past 12 months (15.9%, 11.4 ± 0.7 years). Using multivariate analysis, 2 factors were significantly correlated;

player height and coaches' opinion on the number of games per year (Table 4). The odds ratios (95% confidence interval) were 1.08 (1.01–1.15, P = 0.02) for height and 0.29 (0.11–0.75, P = 0.01) for coaches' opinion on the number of games per year. In short, the taller the player, the greater the incidence of elbow pain; further, when coaches believed that there were many games in a season, fewer players were predisposed to elbow pain. However, we could not establish a correlation between elbow pain and knowledge of and compliance with pitch count recommendations using the multivariable analysis.

DISCUSSION

The present study reveals the ratio of coaches of Japanese youth baseball teams who have correct knowledge of and comply with the pitch count recommendations. In addition, this study investigated the relationship between player-reported elbow pain and coach-related factors. We demonstrated that the ratio of knowledge of recommendations was similar to levels in the US but that compliance in Japan was lower. While there was no correlation between these coach-related factors and player elbow pain, we found that coaches' opinion on the number of games played in a season was a significant factor. Thus, coaches may need to recognize that "overuse" includes the amount of training as well as pitch counts.

In our study, we found that 39.8% of coaches surveyed had correct knowledge of the Japanese pitch count recommendations. This is similar to the 43% reported in the US in

156 2012.[1] In that study, Fazarale et al stated that knowledge of the limit was poor despite
157 significant efforts to educate coaches regarding youth baseball pitching injuries. We are now
158 able to suggest the same problem is occurring in youth baseball in Japan. In Japan, there have
159 been many education programs aimed at preventing throwing injuries. Annual medical checks
160 have been held for secondary prevention in each prefecture, and handbooks on injuries have
161 been distributed.[6,13] It is important to examine the knowledge's issue at a global level.
162 However, our results show that only 28.3% of the Japanese coaches that we surveyed
163 complied with the pitch count recommendations, which is obviously lower than the value of
164 73% that was seen in the US. Thus, it appears that differences between baseball systems and
165 customs at levels from the recreational to the professional have resulted in these differing
166 compliance levels. For example, it is common that starting pitchers are changed after
167 approximately 100 pitchs in Major League Baseball, but this is not the case in Japan’s
168 professional baseball league. Thus, we need to work on this issue at the national level with
169 many coaches.

170 The present study found no correlation between elbow pain and knowledge of and
171 compliance with the pitch count recommendations; however a coach’s opinion on the number
172 of games per year was indicated as the most significant risk factor for player elbow pain. If
173 coaches regarded the number of games to be many, players were less predisposed to elbow
174 pain. This may reflect a subconscious decision on the part of the coaches; if they feel that the

players have played many games, they may subconsciously reduce the amount of training. Therefore, we hypothesize that decreasing the amount of training, or not promoting "overuse," results in fewer episodes of elbow pain among players. Given this, we may need to broaden or focus to include pitch counts as well as other factors related to the amount of training. Thus, it is important that coaches recognize that "overuse" includes the amount of training as well as pitch counts.

There are several limitations in this study. First, there may be poor reliability in the questionnaire as was the case with the previously mentioned US-based study of Fazarale et al.[1] There may also be recall bias in players' memory of episodes of elbow pain, and we were also unable to investigate the severity and location of that pain. The second limitation is the differences in recommended pitch count limits between the US and Japan. Thus we cannot compare the knowledge and compliance ratio directly. However, we believe that it is meaningful to verify differences in knowledge of the recommendation between each country. It is also important that we now work on this knowledge problem at a global level.

CONCLUSION

In this study, we demonstrated that levels of knowledge of pitch count recommendations were similar in Japan and the US. However, we found that compliance with this limit was far lower in Japan. In addition, we observed that "overuse" needs to be more clearly defined. We

may need to extend our focus beyond knowledge of and compliance with the recommendations. Without strict compliance, the recommendations on pitch count limits are meaningless and it is therefore important to examine the Little League elbow problem from various perspectives at both a global and a national level.

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232

233 Table 1. Comparison between pitch limit recommendations for 12-year-old baseball

234 players in the US and Japan (excerpts from each recommendation)[8,12]

235

	USA Baseball Medical & Safety Advisory Committee Guideline	Japanese Society of Clinical Sports Medicine recommendations
Country	USA	Japan
Year recommended	2006	1995
Pitch counts		
per day	75 pitches	50 pitches
per week	100 pitches	200 pitches
per season	1000 pitches	–
per year	3000 pitches	–
Practice days	–	3 days/week
Practice hours	–	2 hours/day
Pitch type	Avoid breaking pitches	(Prohibited)
Multiple league	Discouraged	–
Year-round	Discouraged	–

baseball

236

237

238 Table 2. Comparison of groups with and without knowledge of the pitch limit

239 recommendations

240

	Knowledge	No knowledge	
	n = 45	n = 68	P-value
	mean ± SD	mean ± SD	
Age of coaches (years)	50.0 ± 12.4	46.1 ± 8.6	0.07
Number of years spent coaching baseball	9.9 ± 11.2	7.8 ± 7.4	0.27

241

242

243 Table 3. Comparison of groups complying with and not complying with the pitch limit

244 recommendations

245

	Complying	Non-complying	
	n = 32	n = 81	P-value
	mean ± SD	mean ± SD	
Age of coaches (years)	51.6 ± 13.4	46.1 ± 8.6	0.04*
Number of years spent coaching baseball	10.2 ± 11.2	8.0 ± 7.5	0.34

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247 (*P < 0.05)

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249 Table 4. Coach- and team-related variables related to elbow pain among players

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	With pain	Without pain	Odds ratio (95% CI)	P-value
	n = 54	n = 285		
	Mean ± SD or n (%)			
Age of players (years)	11.4 ± 0.7	11.2 ± 1.0	1.09 (0.65–1.84)	0.74
Height (cm)	144.2 ± 7.4	140.7 ± 7.3	1.08 (1.01–1.15)	0.02*
Weight (kg)	35.3 ± 6.3	33.7 ± 6.1	0.98 (0.91–1.06)	0.62
Years played baseball	2.8 ± 1.3	2.7 ± 1.5	0.91 (0.71–1.17)	0.44
Age of coaches (years)	51.7 ± 10.2	51.3 ± 10.2	1.02 (0.95–1.09)	0.64
Number of years spent coaching baseball	13.1 ± 10.3	11.9 ± 10.1	0.99 (0.92–1.06)	0.77
Number of years that coaches played baseball	11.8 ± 6.8	12.6 ± 8.1	1.01 (0.96–1.05)	0.83
Number of games per year				
≤50	19 (35.2%)	102 (35.8%)	1 [Reference]	
>50	35 (64.8%)	183 (64.2%)	1.29 (0.58–2.88)	0.54
Opinion on the number of games				

Moderate	34 (63.0%)	147 (51.6%)	1 [Reference]	
Many	10 (18.5%)	98 (34.4%)	0.29 (0.11–0.75)	0.01**
Few	10 (18.5%)	40 (14.0%)	1.21 (0.47–3.11)	0.70
Training days per week	2.5 ± 0.8	2.5 ± 0.9	0.93 (0.61–1.42)	0.74
Presence of off-season	31 (57.4%)	179 (62.8%)	0.66 (0.34–1.28)	0.22
Number of coaches with knowledge of the recommendations	11 (20.4%)	67 (23.5%)	1.84 (0.51–6.66)	0.35
Number of coaches complying with the recommendations	6 (11.1%)	44 (15.4%)	0.31 (0.06–1.56)	0.16

(**P < 0.01, *P < 0.05)

CI, confidence interval